

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
20 October 2005 (20.10.2005)

PCT

(10) International Publication Number  
**WO 2005/099118 A3**(51) International Patent Classification<sup>7</sup>: **H04B 1/707**(21) International Application Number:  
PCT/US2005/010867

(22) International Filing Date: 30 March 2005 (30.03.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/558,174 31 March 2004 (31.03.2004) US(71) Applicant (for all designated States except US): **BOARD OF TRUSTEES OF MICHIGAN STATE UNIVERSITY** [US/US]; 246 Administration Building, East Lansing, MI 48824 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SALEM, Fathi, M.** [US/US]; 1848 Elk Lane, Okemos, MI 48864 (US). **WAHEED, Khurram** [PK/US]; 280 West Renner Road, #5312, Richardson, TX 75080 (US).(74) Agents: **FALCOFF, Monte, L. et al.**; Harness, Dickey & Pierce, P.L.C., P.O. Box 828, Bloomfield Hills, MI 48303 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

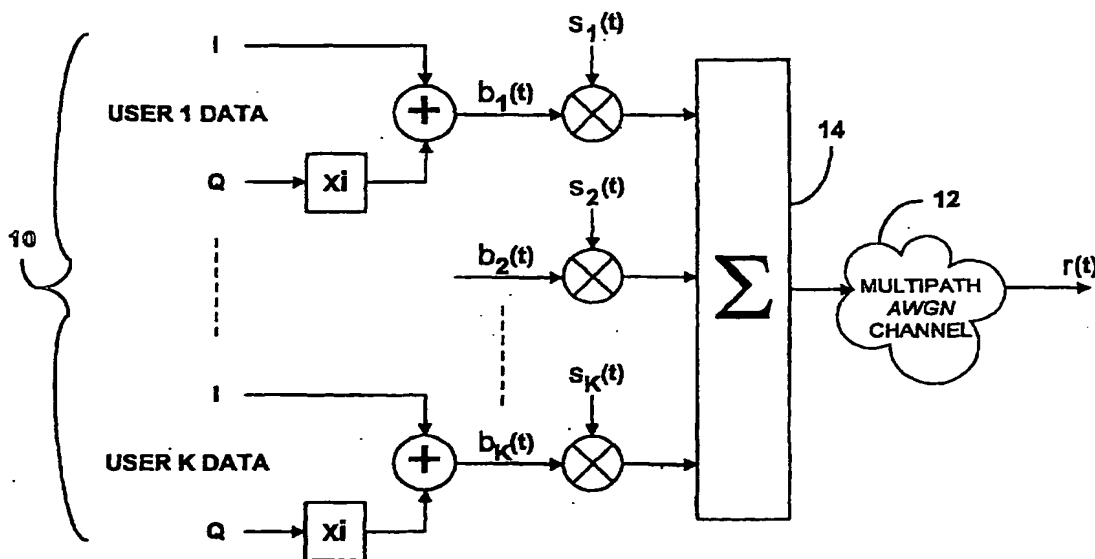
Published:

— with international search report

(88) Date of publication of the international search report:  
12 January 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MULTI-USER DETECTION IN CDMA SYSTEMS



(57) Abstract: A natural gradient Blind Multi User Detection (BMUD) network system and method adaptively estimates a set of matrices to counter a linear convolutive environment model. Feedforward and feedback network structures may be implemented, with or without matrix inversion. In other aspects, an adaptive weighting matrix is introduced into a RAKE structure, and the matrix is adaptively estimated using Principal Component Analysis (PCA) computational techniques and/or static Blind Source Recovery (BSR) computational techniques based on Independent Component Analysis (ICA).